Engineering Mechanics, Ph.D.

The master of science and doctor of philosophy degrees in engineering mechanics are offered within a graduate program covering contemporary areas in both theoretical and applied mechanics. With the guidance of a major professor, a program can be designed to meet an individual student's needs and interests.

The program is broadly structured into several main areas of instruction and research interests in mechanics of materials and astronautics: continuum mechanics, computational mechanics, dynamics and vibration, fluid mechanics, nanomechanics, solid mechanics, and biomechanics. Related fields in which minor work may be done include civil and environmental engineering, chemical and biological engineering, electrical and computer engineering, materials science, mechanical engineering, nuclear engineering and engineering physics, physics, geological engineering and geology, mathematics, statistics, and computer science.

Current faculty research interests include adhesive-bonded joints; composites; failure criteria; analytical and computational solid mechanics; analytical and computational dynamics; multibody dynamics; analytical and computational active and passive space-structure control systems; dynamic stability; nonlinear fracture mechanics of traditional and advanced materials; continuum mechanics; modal analysis; nanomechanics and nanotribology; fluid-structure interaction; non-Newtonian fluid flow; structural mechanics; viscoelasticity; viscoplasticity; cell mechanics; and biomechanics.

Laboratories are well equipped for experimental testing and research; these include holography, Moire, atomic force microscopy, vibration testing, and other optical methods for experimental mechanics research. The department has access to collegewide facilities. The Wisconsin Laboratory for Structures and Materials Testing has facilities for testing large structures, fatigue and vibration labs, and complements the department's laboratories. The Materials Science Center provides state-of-the-art instrumentation, support facilities, and expert technical assistance for research and education in materials. Its facilities include scanning and transmission electron microscopes, image processing and analysis systems, surface and thin film characterization facilities, and x-ray diffraction facilities.

Funding

Prospective students should see the program website for funding information.

Requirements

Minimum Degree Requirements and Satisfactory Progress

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirements) in addition to the requirements of the program.

Doctoral Degrees

Ph.D.

Minimum Graduate Degree Credit Requirement

51 credits

Minimum Graduate Residence Credit Requirement

32 credits

Minimum Graduate Coursework (50%) Requirement

26 credits must be in graduate-level coursework from EMA, math, physics, computer science, or any other engineering department except EPD; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

Prior Coursework Requirements: Graduate Work From Other Institutions

With program approval, students are allowed to count no more than 6 credits of graduate coursework from other institutions toward the minimum graduate degree credit requirement and the minimum graduate coursework (50%) requirement. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

Prior Coursework Requirements: UW–Madison Undergraduate

With faculty approval, students who have received their undergraduate degree from UW–Madison may apply up to 7 credits numbered 400 or above toward the minimum graduate degree credit requirement. This work would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. No credits can be counted toward the minimum graduate residence credit requirement. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

With faculty approval, students who have received an ABET-accredited undergraduate degree (not including UW–Madison) may be eligible to apply up to 7 credits of their undergraduate coursework toward the Minimum Graduate Degree Credit Requirement. No credits can be counted toward the Minimum Graduate Residence Credit Requirement, nor the Minimum Graduate Coursework (50%) Requirement. Coursework earned five or more years prior to admission to a master’s degree is not allowed to satisfy requirements.

Prior Coursework Requirements: UW–Madison University Special

With program approval, students are allowed to count up to 15 credits of coursework numbered 400 or above taken as a UW–Madison Special student toward the minimum graduate residence credit requirement, and the minimum graduate degree credit requirement. UW–Madison coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.
CREDITS PER TERM ALLOWED
15 credits

PROGRAM-SPECIFIC COURSES REQUIRED
The candidate is required to complete at least two EMA courses numbered 600 or above and an additional four courses numbered 700 level or above. The 700-level courses must include at least one EMA course, while the remainder may be from EMA or the list found in the student handbook.

DOCTORAL MINOR/BREADTH REQUIREMENTS
Technical minor: 10 credits in either a single department or multiple departments as approved by the advisor.

OVERALL GRADUATE GPA REQUIREMENT
3.00 GPA required

OTHER GRADE REQUIREMENTS
A course that is to be counted toward the M.S. degree must be passed with a grade of A, AB, or B.

PROBATION POLICY
A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time enrollment (or 12 credits of enrollment if enrolled part-time) the student may be dismissed from the program or allowed to continue for one additional semester based on advisor appeal to the Graduate School.

ADVISOR / COMMITTEE
All students are required to meet with his or her advisor prior to registration every semester.

ASSESSMENTS AND EXAMINATIONS
All students must take the Ph.D. qualifying examination. After acceptance of the student’s doctoral plan of study, the student must take an oral preliminary examination.

Final oral examination is required at the end of the thesis work.

TIME CONSTRAINTS
The Ph.D. qualifying examination should be first taken no later than completion of the M.S. requirements, or the beginning of the fourth semester of graduate study, whichever comes first. Students entering the program with a master’s degree in EMA, EP or NE from another institution, and taking the qualifying exam in that same major, must take the exam by the beginning of their third semester.

Students must submit the doctoral plan of study one month before the end of the semester following the one in which the qualifying exam is passed.

Candidates are expected to pass the Ph.D. preliminary examination no later than the end of the third year of graduate study, or by the end of the second regular semester following the one in which the Ph.D. qualifying examination was passed, whichever is later.

An oral examination on the findings of the Ph.D. research is required at the end of the thesis work. The candidate must apply for a warrant from the Graduate School through the student services office at least three weeks prior to the exam.

LANGUAGE REQUIREMENTS
No language requirements.

ADMISSIONS
The Graduate School sets minimum requirements for admissions (https://grad.wisc.edu/admissions/requirements). Academic program admission requirements are often more rigorous than those set by the Graduate School. Please check the program's website for details.

LEARNING OUTCOMES

KNOWLEDGE AND SKILLS
• demonstrate an ability to synthesize knowledge from a subset of the biological, physical, and social sciences to help frame problems critical to the future of their discipline.
• conduct original research.
• demonstrate an ability to create new knowledge and communicate it to their peers.

PROFESSIONAL CONDUCT
• fosters ethical and professional conduct.

PEOPLE
Faculty: Professors T. Allen, Blanchard (chair), Bisognano, Bonazza, Crone, Drugan, Fonck, Hegna, Henderson, Kammer, Kulcinski, Lakes, Moses, Pfotenhauer, Plesha, Smith, Sovinec, Waleffe, Wilson; Associate Professors M. Allen, Witt; Assistant Professor Schmitz; Affiliate Professors Bednarz, Bier, Deluca, Graham, Ma, Mackie, Miller, Morgan, Nellis, Porter, Robertson, Szlufarska, Thomadsen, Trujillo, Vanderby